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ABSTRACT

Measures of the implementation of an individualized curriculum in 52 classrooms at the second-grade level are presented. The study also uses the measures of classroom processes to help explain student achievement on standardized tests of reading and mathematics. The classroom process data are further analyzed to see if systematic differences occur in implementation which are attributable to the ethnic composition of the school or to the degree of urbanization of the school setting. (Author)

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EVALUATION OF THE IMPLEMENTATION OF A PROGRAM OF ADAPTIVE EDUCATION AT THE SECOND GRADE (1972-73)

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Evaluation of the Implementation of a Program of Adaptive Education at the Second Grade (1972-73)

Introduction

Evaluative research in education is a relatively new field of investigation (Rossi, 1972). Systematic research in the field has concentrated in two areas. The first area consists of research related to product development, generally called formative evaluation. Unfortunately little of the applied research in this area finds its way into the public arena (Light, 1972). The second area consists of the massive long term research related to end products, designated summative evaluation (Scriven, 1972). In order to integrate these two functions, there is a need in education to document the implementation of school programs in a way which provides information to program developers about the effects of variation in classroom processes on outcomes, in the formative sense, while providing the same information to educational consumers in the summative sense. Stated slightly differently, information about classroom process should be considered as a set of dependent variables to provide information to developers and as an independent variable which explains achievement to provide information for educational consumers. It is the purpose of this paper to consider information about classroom processes in a specific program of adaptive education in this way.

Related Research. In part because of the newness of educational evaluation and in part because of the nature of the field, educational evaluation must be eclectic in its selection of theoretical basis. For example, this study draws its theoretical framework from three streams of

thinking. The first and most significant contribution has come from the literature on program evaluation. All of the major models of program evaluation include some aspect of process as a significant component of the evaluation information required (Cooley, 1971; Stake, 1967; Lindvall & Cox, 1970). The second area of influence comes from the line of research which related to classroom observation and the relationship between classroom variables and achievement. The major contributions of this field have been toward indentifying and in some cases solving the methodological problems in obtaining stable, interpretable and useful measures of classroom process (Rosenshine, 1971; Stufflebeam, 1971; Wang, 1973). The third area, the specific context in which this study was done, is the research and development work on adaptive educational programs which is on-going at the Learning Research and Development Center (LRDC). The study is especially dependent on the thinking and definitions of adaptive education of Glaser (1968, 1971, 1973), and Resnick, Wang, and Rosner (1974).

Purpose. The purpose of this study was to provide measures of the implementation of the LRDC's program of adaptive education in 52 classrooms located in 21 schools, and to relate specific variations in the implementation to variations in educational achievement. Within that rather broad statement of intent, four major objectives were identified. First, to provide classroom process data which describe the implementation of the major dimensions of the educational program. Second, to contrast specific dimensions of the model as they are implemented in rural versus urban settings and in predominately black, white, or integrated school districts. Third, to use these data to explain achievement test results on standardized measurement instruments. Fourth, to compare the implementation of the programs over a two-year period and contrast the explanative power of the process variables from one year to the next.

Model. The model of evaluation which is used in this study has been proposed by Cooley and Lohnes in a forthcoming book[1]. Two evaluative questions which are asked by their approach are: What effects in achievement can be attributed to specific elements in an innovative educational program? And what effects in achievement are confounded with interactions between program elements and entering abilities? They assume that it is inappropriate to ignore differences in entering behaviors either by failing to attend to them at all or by totally removing both entering behavior and all correlated process variation from consideration through a partialling procedure. The Cooley-Lohnes Model is a synthesis of identified evaluative concerns such as: measuring the dimensions along which educational treatments vary, examining the confounding and unique contributions of input and treatment, deciding upon the appropriate unit of analysis, selecting valued outcome measures, and dealing with correlations within the input, process and outcome data.

There has been an assumption in most discussions of program evaluation that in summative evaluations it is acceptable to attribute differences in programs (Tatsuoka, 1972) rather than to document consistency and variation within and between programs. The problem with this assumption is that there is a need to examine both within and between differences in programs as they appear in the classroom, not just to assume the relative similarity of programs under the same name (Lohnes, 1973). The limitation of the type of evaluative model I am employing is that it is correlational in nature and it, therefore, relies on replication as opposed to control by

[1]Cooley & Lohnes in preparation.

randomization for validation of findings. To some extent, however, the limitation is also an advantage. The Cooley-Lohnes approach views educational evaluation as an on-going process. The specific evaluative effort reported in this paper has been going on for three years, although the focus of information reported covers only one academic year. The distinct advantage of the model is that it fits the realities of most educational settings (e.g., no control of assignment of treatment, etc.). Other models tend to sidestep the issue that classrooms are not corn fields, and that although many universities have so-called laboratory schools, they bear no resemblance to experimental agricultural plots found in departments of agricultural research.

Setting

The study reported in this paper was conducted during the 1972-73 academic year. It is a direct follow-up and expansion of a 1971-72 study (Leinhardt, 1974). The evaluative effort has been focused at the second grade level at all sites rather than at all grade levels at a few sites. The assumption is that there is greater consistency in terms of process within sites across grades than within grades across sites.

Background. The Learning Research and Development Center has been one of 22 national Follow Through sponsors. Each sponsor in the system is responsible for implementing its program at those sites which have chosen that particular model. The LRDC implements its reading and mathematics programs in seven Follow Through sites and two developmental sites. This means that the programs are implemented to some degree in 52 second grade classrooms with an average of 5.7 classrooms per site. The LRDC Follow Through sites extend from North Dakota to Arkansas to West

Virginia. Out of the total of nine sites, three are predominately urban, five are predominately rural and one is suburban. Four of the sites are predominately white, two are predominately black and three are racially integrated. No site has been included in the evaluation study unless the program has been implemented at that site for at least one year prior to this study. Therefore, the study which was conducted during the 1971-72 year was based on four Follow Through sites and two developmental sites with a combined total of 30 classrooms, while the present study was based on seven Follow Through sites and two developmental sites.

Instructional Setting. The basic characteristics of the LRDC instructional model are that: (1) it provides an environment which is adaptive to the educational needs of the student, (2) the curricula are organized and presented in a way which attempts to teach and reinforce basic cognitive skills, and (3) the student directs and controls his or her own learning within the context of the curriculum. Behaviorally, this means that the specific subject matter areas are broken down into units and objectives which are hierarchically sequenced in a curriculum. Placement, curriculum embedded tests (CETs), and posttest are constructed for each unit so that students can be initially placed and their success in learning the material can be monitored. By using the placement, CETs, and posttests, prescriptions are written for each student on a daily, weekly, or monthly basis. If a student does not pass a CET, (s)he continues in the same area with additional practice work. If a student does not pass a posttest, (s)he is recycled through the appropriate sections of the curriculum and retested.

The classroom normally has one teacher and one assistant or aide for 25 children. Usually, the teacher and assistant both circulate (travel) around the room during the work period, sometimes one will circulate while

the other administers or corrects tests or tutors small groups. While circulating, the teacher or assistant corrects the work being done, occasionally alters prescriptions, offers brief tutorial assistance, and supports the student emotionally and academically. In general the morning is divided into a work period in which assignments are prescribed and an exploratory period during which the children investigate curriculum related material on their own. Classrooms vary in the degree to which students control the decision points in their daily learning situation, such as: which subject to study and when, which assignment to do first, when to work on formal curriculum, when not to, when to take a posttest, when to change units, etc. Thus, while the curriculum is relatively consistent from classroom to classroom, there are quite a few areas in which there can be differences in implementing the program.

The differences which occur between classes that are implementing the LRDC's model of adaptive education can be classified into six major domains. They are: Context, or background information which is not controlled by implementation; Allocation of Time, or the distribution of time by subject matter; Assignment Procedures, or the degree to which assignments are tailored to individual needs; Student Progress, or the frequency and manner of monitoring student learning; Student Autonomy, or the type of decision-making opportunities students have; and Attendance. These six domains represent areas in which any classroom implementing this educational program would be expected to show variation. For example, time is used differently in many different types of classroom settings, some classes have open subject matter scheduling others assign blocks of time for each subject area.

Procedure

During the 1972-73 school year, data were collected to help in the evaluation of the LRDC instructional model. These data were collected at seven Follow Through sites and two developmental schools all of which were using the LRDC curricula in math and reading. The data came from four sources: (1) aptitude and achievement data were obtained from three sets of standardized tests: the Lorge-Hagen-Thorndike Test of Cognitive Abilities (1968) administered in the fall, the Wide Range Achievement Test (WRAT) (1965) arithmetic subtest, and the Metropolitan Achievement Test (MAT) (1971) reading subtests both administered in the spring; (2) a questionnaire on classroom process which was designed to tap the six domains listed above; (3) individual student curricular placement and progress records; and (4) the teacher's class schedule. The last three sources yielded information on 29 measures of classroom process. Figure 1 is a list of the 29 variables and the domains which were tapped by them.

Instruments. The majority of the variables listed (22 of 29) were obtained from the 19 item questionnaire, which was administered three times during the year. The questionnaire was answered by the classroom teacher in November, the local education specialist in February, and the LRDC consultants in April. Three different individuals filled out the questionnaire to avoid over burdening any one of them. The data from the three administrations were then averaged.

Four other variables were obtained from the student profile sheet which were cumulative and provided accurate and easily accessible information about student progress through the math and reading curricula. These sheets were kept by the classroom teacher or aide and were sent to the

Center four times during the school year. The remaining three variables, concerning time allocations, were obtained from the class schedules which were sent to the Center at the end of the year.

The questionnaire focused on gathering information from six major domains. The questionnaire will be described briefly by domain.

Classroom Context. This domain consists of five variables: the teacher's total years of teaching experience, the teacher's years of experience with this program, teacher's years of experience in working with the particular aide, the number of children enrolled in the class, and the number of usable square feet per child in the classroom, excluding furniture. While none of these variables relate directly to the LRDC's program, they certainly are likely to affect the results of that program. The number of years of experience which the teacher has had with the program indicates not only the facility with which a teacher can be expected to use the program, but also an indication of how happy a teacher is with it. The number of children enrolled and the amount of space available per child are both variables which relate to the conditions under which learning will occur and they can be expected to affect both climate and specific elements of the program, such as the frequency and nature of feedback.

Allocation of Time. The data gathered from 1971-72 indicated that there was a postive and significant relationship between the amount of time spent in mathematics per day and the level of mathematics achievement (Leinhardt, 1974). During the 1972-73 year more extensive information was gathered on the way in which individual teachers and sites spent the time available to them. The effort to identify actual time allocation focused on two aspects. First, what percentage of the day is spent in specific modes of instruction such as: individualized instruction, small group

Figure 1

Classroom Process Variables

Classroom Context

Total teacher experience in number of years

Total teacher experience with the LRDC instructional model in number of years

Teacher-aide team experience with the LRDC instructional model in number of years

Number of children enrolled in the class

Number of square feet per child

Allocation of Time

Percentage of time spent in individualized activity

Percentage of time spent in small group activity

Percentage of time spent in large group activity

The number of minutes spent in math

The number of minutes spent in reading

The number of minutes spent watching educational TV

Blocked or open scheduling of subjects

Use of math maintenance programs.

Assignment Procedures in Mathematics

Percentage of unique assignments -- the percentage of the total assignments given which were different from any other given

Percentage of blocked assignments -- where a blocked assignment was three or more consecutive pages or boxes with less than an equal number of isolated pages or boxes

Assignments are or are not given during exploratory time

Assignments are or are not changed during the day

Figure 1 (continued)

Monitoring Student Progress

Percentage of pretests used for assignments in mathematics

Percentage of CETs used for assignments in mathematics

Percentage of posttests used for assignments in mathematics

The number of days since the last test of any type was given

Initial student placement in the math curriculum

Initial student placement in the reading curriculum

Student progress in the math curriculum

Student progress in the reading curriculum

Provisions for Student Self-Direction

Student control of access to exploratory

Sum of check list of student self-direction for total class

Attendance

Number of days of teacher absence

Percentage of children present on sample days

instruction and large group instruction. Second, what were the approximate amounts of time per day during which a child was exposed to specific subjects such as math, reading, or educational TV. The last two variables in this domain relate to specific classroom practices with time allocations. The first deals with whether or not different students are working on different subject areas during the same time period. The second deals with whether or not the classrooms are using math maintenance programs.

Assignment Procedures. This domain deals with an especially important aspect of individualized education, the assignment procedures. It is through the accurate matching of student needs and curriculum content that much of curricular individualization is achieved. The first two variables in this domain are the percentage of unique assignments (the percentage of assignments given which are different from any others given with respect to level and skill) and percentage of blocked assignments (three or more consecutive tasks or pages with less than an equal number of isolated tasks). These variables attempt to monitor the way in which the teacher makes the assignments in the class using the mathematics assignments as the sample of assignment practices in general. The next two variables are questions about assignment policies: Are exploratory assignments given, and are assignments changed during the day? This last variable is an attempt to measure, indirectly, how responsive (on a daily basis) teachers are to students. The assumption is that if teachers do occasionally modify assignments during the day, they do so in response to specific student needs.

Monitoring Student Progress. This domain deals with the classroom practices used by the teacher to monitor the movement of students as they work in and complete the mathematics curriculum. The LRDC instructional model provides for frequent systematic checks on the students' learning

progress. These checks are generally in the form of individualized self-administered tests. These tests fall into three main categories: pretests, curriculum embedded tests (CETs) and posttests. It is of interest to know which kind of test the teacher is using for prescription purposes. It is also of interest to know how frequently the teacher is checking the child's progress. Developers expect that teachers will use CETs about 60 percent of the time, pretests about 25-30 percent of the time and posttests about 10-15 percent of the time for prescribing or assigning purposes. It is also expected that children will take at least one test of some type at least once every 5 to 7 days. The next four variables in this domain deal with the placement (where the student started work in the curriculum) and progress (the amount of work the student completed in the curriculum) of students in the math and reading curriculum.

Provisions for Student Autonomy. One of the continual long-range goals of the LRDC model is to develop independent learners. In accordance with this there are many ways in which a teacher can provide opportunities within the classroom for the student to learn to exercise autonomy. The most obvious opportunity for this to occur is during the exploratory time. But, there are other subtle ways during the prescription time in which the teacher can convey to the student their responsibility for their own learning. The autonomy check list (Question 11 on the questionnaire) is an attempt to identify most of the opportunities for student autonomy which would exist in a classroom and list them. It is also the first step in developing a specific measure of student autonomy.

Teacher and Student Attendance. Both teacher and student attendance are important variables relating to the implementation of the LRDC program. If the teacher is consistently absent, the chance of the program

being correctly implemented, and of children making steady educational progress goes down. If the students are not present in school, they cannot generally benefit from instruction. Although an individualized program makes student absenteeisn less damaging than in traditional ones, it is still a matter of concern when attendance is low. Good attendance can also be taken as an indication of a positive attitude toward school in general.

The assignment of variables to the domains which have been discussed is to some extent arbitrary. For example, when the general domain of allocation of time was considered the specific question concerning whether or not different subjects were taught at the same time or not was raised, and so the variable is considered in this discussion to belong to that domain. However, that particular variable could be considered to belong to other domains as well, such as: management proceedings, assignment procedures, or even student autonomy. The point is that the variables and domains are not to be interpreted as a rigid set of definitions, but as a convenient way of considering a rather large number of classroom process variables. Thus, it is expected that the domains may be expanded or contracted as more information about classroom practices is gained or as the utilization of the information changes.

Reliability

When an investigation moves from the pure confines of measurement theory and classical experimental design into the relative disorder of the classroom, a host of questions concerning the validity of the findings arise. While classical test construction settings can assume that the underlying characteristic being measured remains stable and only the precision of measuring it varies, no such assumption can be made for any measurement of classroom characteristics.

When classroom characteristics are measured, not only must the instrument's reliability be estimated, but also the stability of the characteristics itself should be investigated. This problem and its solution have been noted by anyone who is seriously concerned in investigating classroom processes, such as Rosenshine (1971), Ross (1974), and Keeves (1973) to mention only three. What has also been noticed is the extreme difficulty in obtaining high estimates for classroom stability, which frequently makes results ambiguous.

For the purposes of this study, it appears userful to report three estimates of reliability: inter-coder reliability, instrument reliability, and the classroom stability. Inter-coder reliability (Pearson product moment correlation) was estimated to be .98. Instrument reliability (Pearson product moment) was estimated to be .90. Instrument reliability was considered to be the reliability of variables which should <u>not</u> change over the year such as: number of years of teacher experience (teaching, in the program, and with the aide), the size of the room, and the space allocated for exploratory. The correlation was calculated between the fall and spring questionnaires. The classroom stability using Cronbach's (1963) intra-class correlation was .76. This was calculated on the variables which could be expected to change during the year.

Both instrument reliability and classroom stability are confounded with inter-respondent reliability because different individuals filled out the questionnaires. This was done intentionally, not only to distribute the burden of responding to the questionnaire, but also to give useful feedback to the Follow Through staff itself about the differences between the teachers', specialists', and LRDC consultants' knowledge and perceptions

of the classrooms involved. As a primary purpose of collecting the data was to gain information not estimate reliabilities of measures, this seemed like a legitimate procedure.

Findings

This section addresses four questions. First, in a descriptive sense, what does a program of adaptive education look like when it is implemented in a network of schools as contrasted to what developers thought it should look like? Second, in a comparative sense, in what way are differences in implementation systematic with respect to differences in the location and composition of those sites? Third, how successful is a generalized construct of process variables in explaining differences in student achievement which are not explained by differences in student input. Fourth, how similar are the results over a two-year period?

Program Implementation

One purpose of this study was to provide information about the implementation of the major dimensions of the educational program and to compare the implementation to previous years. This information must be provided before any more sophisticated analysis of the data can be interpreted. The clearest and most direct way of presenting these data are by means and standard deviation by site. While the raw data by classroom is, of course, available, it was felt that it would be more comprehensible and interpretable to examine nine school sites on 29 variables than to examine 54 classrooms on 29 variables. However, in order to preserve a sense of the variations within sites, the standard deviations presented represent the standard deviations of the classroom means rather than the means of the classroom standard deviations.

Tables 1 through 6 present the results by site. Each table presents the data for one of the six domains listed in Figure 1. The data for each table will be briefly discussed.

Context Variables. In Table 1 the site averages on five context variables are presented. It can be seen from the first variable, the number of years of teacher experience, that the sites vary tremendously. Site 1 teachers have an average of 2.2 years experience while Site 4 teachers have an average 22.4 years experience. The next two variables, the years of teacher experience with the program and the number of years which the teacher/aide team has been working together, are highly dependent on the number of years that LRDC has been involved with individual districts. That is, it is nearly impossible for a teacher to have more years experience with our program than the number of years we have associated with that site. In spite of that, one can see from Table 1 that Sites 3-5 with which we have been involved the same number of years have differences in the amount of experience their teachers have had with our program. Sites 1, 3, 4, 8, and 9 which were examined last year have increased the number of years of teacher experience with the program. This indicates in an indirect way teacher satisfaction with the program.

The fourth variable, the number of children enrolled, appears to split into two groups, each of which is consistent within sites. One group has an average size of about 25 children and the other has about 20 children which is consistent with the class sizes in 1971-72. The fifth variable, the number of square feet, seems to vary quite a bit both within and across sites. While classroom size does not generally affect achievement directly except at the extremes, it certainly does affect the use of exploratory space and time and the type of interactions which a teacher will engage in with students.

Allocation of Time. The first three variables on Table 2 deal with the percentage of time spent (estimated) in each mode of instruction: individual, small group, large group. Naturally, we would expect to find that approximately half of the day is spent in individualized activity, because the majority of LRDC's instructional program is individualized. Also, we would expect the least amount of time to be spent in large group activity. From Table 2 it is clear that there is noticeable difference between the sites. Most sites spend between 2/3 and 3/4 of the day in an individualized instructional mode. However, sites 1 and 3 spend slightly less than half of their time in individualized instruction.

The second assumption is that the least amount of time should be spent in large group activity. This assumption is based on the fact that the early part of the reading program specifies a good deal of small group work. However, the data show that five of the sites spend more time in large group activity than in small group. Of course, it should be remembered that this information refers to the entire school day, not just the three and one-half hours during which the program is implemented. In sites 2, 4, 5, and 7 where more than half of the day is spent in individualized activity it means that the sites are individualizing more than just those subjects for which LRDC provides curriculum material (sites 8 and 9, however, do have additional Center material). This is an encouraging and exciting sign of commitment on the part of teachers and schools to individualization.

The amount of time spent on math and reading deaily were related to achievement in 1971-72. It can be seen from Table 2 that there is quite a bit of variability across districts on these two variables. The amount of time spent on mathematics stayed approximately the same for all sites observed last year. The amount of time spent on reading went down slightly

for three (1, 3, and 4) of the six sites observed last year, while site 8 went up considerably. The amount of time spent watching educational TV was recorded because we were interested in knowing which, if any, of the sites had chosen to use educational television as a regular part of the academic day. It appears that those classrooms which do watch educational TV, do so very infrequently and as a result, little affect on achievement is expected.

The next variable, different subjects studied during the same time period, appears to occur in some classrooms at most sites. (The exceptions are sites 5 and 9 where all classrooms report block scheduling.) This is interesting because the Center is beginning to systematically investigate the different effects and relative advantages of open and blocked scheduling (Wang, 1974). The last variable, whether or not a math maintenance program is used, indicates that the majority of classrooms in most districts use some form of math maintenance. The utility of a uniform math drill program is a question of considerable concern among implementors. It is hoped that these data might shed some light on its utility.

Assignment Procedures. The first two variables reported in Table 3, the percentage of unique assignments and the percentage of blocked assignments, indicate the way in which the teacher makes the assignments in the class. It appears that the teachers in the sites are making very unique assignments. In fact, the assignments overall are 30 percentage points more unique than that reported in previous years. The percentage of assignments which are blocked is, however, also quite high for all districts ranging from 47 percent to 89 percent. In the mathematics curriculum (from which both of these variables are taken) the guidelines suggest that only those pages or boxes which are needed as a result of failure to pass specific items

on a test be assigned. However, it may be that the amount of time required to prescribe so specifically is not worth the additional effort once the initial starting point in a curriculum is identified for a student.

The next two variables, exploratory assignments given and assignments changed during the day, both occur in the majority of classrooms in the majority of sites. Recently, there has been an effort to identify the activities in the exploratory area more closely with curriculum. It appears from the data that the exploratory time and materials are now more tightly related to the curriculum. It should be noted, however, that the item in the questionnaire asked if <u>any</u> assignments are given -- so the positive reply does not indicate that all exploratory activity is now controlled by the teacher. The last variable is an attempt to measure how responsive (on a daily basis) teachers are to students. The assumption is that if teachers do occasionally modify assignments during the day, they do so in response to specific student needs. It is, therefore encouraging to see the majority of teachers stating that they do this.

<u>Monitoring Student Progress.</u> The data on the monitoring of student progress are presented in Table 4. It can be seen from all examination of the first three variables that the sites are very close to developer expectations in the teacher's relative use of types of tests. For all sites, except site 8, the CET is the most frequently administered test (71.8% to 29.4%); the pretest is the next most frequently used test (49.8% to 15%); and the posttest is the least frequently used test (18.5% to 6.33%). CETs are the most frequently administered test because they are the most frequent type of test in the curriculum. The number of days since the last test also falls within the expectations of the developers with a range of 3.4 days to 9.7 days.

The next four variables in Table 4 deal with the placement and progress of students in the math and reading curriculum. Placement refers to the unit in which the child started working in the fall; progress refers to the number of units mastered during the year. It is evident from the table that there is a large amount of variation between districts in the placement of students in math and reading (4.2 to 20.9 and 3.0 to 14.4, respectively). This is a reflection of the basic difference in entering ability among the students in different sites. It is also supportive evidence of the need for adaptive education. In addition, there is difference between districts on the amount of student progress in the math and reading curricula; however, it is not nearly so extreme as the difference observed in initial placement (7.9 to 16.8 units progress in math and 5.0 to 8.1 books progress in reading).

Provisions for Student Autonomy. The first variable in Table 5 deals with the question of access to exploratory, while the second variable represents the sum of the number of items checked off on the autonomy check list (a maximum possible score is 14). Table 5 indicates that at most sites a minority of teachers gave students the control of going to exploratory. The second variable indicates that the potential opportunities for autonomy the teacher utilizes relatively few. There seems to be a fairly strong site effect on this variable with marked differences among sites and smaller differences within sites.

Teacher and Student Attendance. In Table 6 the average teacher absences (a day is the unit of measure) as obtained from school records are reported. Table 6 also reports student attendance based on the attendance on three randomly selected days. Teacher absences vary between sites and within sites quite extensively. The extremely high mean and standard

deviation at site 5, 12.0 and 24.0 respectively, is largely due to a single teacher who was seriously ill for most of the spring semester. The data on student attendance are for the most part encouragingly high. Three of the sites remain at about the same level of attendance as last year, site 1's attendance is seven percentage points higher than that reported last year. However, site 8 is 12.0 percentage points lower than last year. This information has been passed on to site 8 as a matter of some concern.

Summary. The function of the previous discussion was to document and describe some of the more important aspects of the implementation of LRDC's educational program. Three major points have been made. First, that while classrooms differ considerably in the basic contextual facilities available to them, and to some extent in their use and allocation of the program materials available to them, they are reasonably consistent in the implementation of key aspects of the program. Second, that although the LRDC program is quite structured and defined in terms of teacher/student roles and the use of the curriculum there is also a considerable amount of leeway for classrooms to adapt the program to fit their particular needs. Third, it is hoped that this information has served to be somewhat descriptive of the basic elements of the program.

Contrasts of the Setting

A second goal of this paper was to examine specific dimensions of the model as they are implemented in rural versus urban settings and in settings which have different racial compositions. The reason for contrasting the implementation of the program in diverse settings is evaluative. It would appear significant, for example, if the program of adaptive education was "exportable" to certain types of schools only, either predominately white or black schools, or to certain areas, such as cities rather than

rural settings. In fact, it seems mandatory for any argument supporting an innovative educational program to show that it is not limited in that way, but rather that it can be implemented successfully in a variety of settings. It is also important, however, to be able to demonstrate that the program has enough flexibility to adapt to the needs and values of different educational and community situations.

In order to test whether or not the program has been implemented equivalently in the various school sites, two one-way multiple analysis of variances were performed using the NYMBUL multivariance computer program Version 5 (Finn, 1972). The program was run on 51 of the 52 classrooms. One was eliminated because of the inability to appropriately assign it to any cell. The two one-way analyses were run rather than a two-way because of two empty cells -- black-rural and integrated-urban.

Before discussing the results, it is useful to delineate which variables were chosen for which reasons and how the sites were grouped for each contrast. For the first contrast, urbanization, the classrooms were divided into two groups: rural and small town population centers of less than 21,000; and urban populations ranging from 75,500 to 520,000. In one boarder-line case of assignment, the nature of the surrounding economy (farming) was taken into consideration (e.g., farming versus industry). There were 32 rural classrooms and 19 urban classrooms. For the second contrast the classrooms were divided into three groups: 11 predominately black classrooms, 17 predominately white classrooms, and 23 integrated classrooms (included in the integrated classrooms were 6 predominately Indian classrooms). In order to deal with the limited degrees of freedom available within cells, ten variables were selected from the intital pool of 29 to be used for this analysis. The variables were chosen from each

domain except context. The context variables were omitted because, in general, they cannot be controlled although they are variables which undoubtedly affect the implementation of ones which can be controlled. Table 7 lists the ten variables which were used in this analysis by domain. Table 7 also indicates the exact probability levels for the univariate F's for the contrasts in question. (Note: The stepped-down F's in no case contradicted the univariate F's at the .05 level.)

The results reported in Table 7 indicate that the program is being implemented at a consistent level independent of makeup or location of the schools involved. For seven of the ten variables, there is no significant (α=.05) difference for either comparison. While this means that the program for the most part is being implemented consistently in a variety of educational settings, it does not mean that there is no difference between individual districts and classrooms. It does mean that those differences are not systematic by geographical or racial setting. The variables which are consistent across settings are: Percent of individualized time, the use of a math maintenance program, the percent of unique assignments, the number of days between tests, student progress in mathematics, opportunities for study autonomy and the number of days of teacher absences. These results are especially exciting for two of the variables: math progress and teacher absence. Equivalent student progress in the presence of vastly different entering abilities is a very impressive statement in support of the effectiveness and efficiency of individualized education. The second variable of special interest, teacher absence, could be considered a morale indicator. In general, teachers in urban settings tend to have higher absenteeism and turnover than those in rural settings (Havighurst, 1968). Teachers using this program seem to be contradicting this trend.

Three of the variables, however, showed differences for these contrasts. In general, urban, black and integrated schools spend more time in mathematics, give more pretests and fewer CETs. Looking more closely at the means for the time spent in mathematics: Urban schools average ") minutes a day in mathematics while rural schools spend 67 and 62 minutes in mathematics while white schools spend 53 minutes in it. (Although it was not included in the analysis, a similar trend was found for time spent in reading.) The decision of how much time to allot for each subject is largely a site decision, which is often modified by individual teacher actions. The LRDC guidelines suggest that at least 60 minutes a day be spent in math so that these data are indicative of some failure to implement this aspect, with rural and white schools getting roughly three hours less math time a month than the other schools.

The next two variables, the percentage of pretests and CETs which are used to make assignments need to be examined together, because the results tend to balance each other out. Urban schools use more pretests than rural ones, but give fewer CETs. It is appropriate to consider the situation in this way because the use of posttests for prescription indicates that the instructional sequence has been ineffective for a child for that particular unit. For example, urban schools used 34 percent pretests and 47 percent CETs for prescription, while rural schools use 21 percent pretests and 67 percent CETs for prescritpion. Or stated another way, approximately 81 percent and 88 percent of the prescriptions are continuation rather than recycling prescriptions. (Of course, the CETs can result in additional work in the same area, but generally they do not result in complete recycling.)

Summary. The purpose of the previous discussion was to show that while there are differences between classrooms on many variables of implementation, these differences are not systematic with respect to geographic

location of school and racial makeup of the classrooms, and it is encouraging to find that this is in fact the case. Of course, only 10 of the 29 variables were examined; however, the ten were chosen to be representative of the major domains of interest. There are other contrasts which could be made which also might be of interest, such as comparing experienced (2 or more years with the program) to inexperienced sites to see if the program becomes substantially more integrated into the particular educational settings over time.

Up to this point, the discussion has focused on the level of implementation of the LRDC program as a dependent set variables without consideration of the effect of the implementation on student achievement. Using the previous description of the educational settings as a background, we will now consider classroom processes as they relate to student achievement on academic tests. That is, we will consider classroom process as the independent set of variables which effect achievement.

Classroom Process and Student Achievement

Several approaches can be used to examine the relationship between student achievement and classroom process. Two approaches will be examined and their relative strengths and weaknesses discussed. The first approach is to use some form of simple correlational analysis. The second approach is to use partial correlations which control input. Either of those procedures would result in a large matrix (29 x 29) of correlations between each of the process variables, input, and outcome measures or of the correlations between the residuals of the process and outcome measures. There are two major problems with either correlational approach. The first is that there is too much data to interpret and absorb. The second is that frequently there is a

high correlation between input, process, and outcome which makes interpretation very ambiguous. For example, schools which have students with high entering abilities frequently have genuinely better school practices. If one fails to control the input, then it is not clear whether the classroom practices or student ability effects achievement. If, on the other hand, input is partialled out in this situation, genuine relationships between process and outcome are lost. In summary, there are two problems which need to be solved in an analysis of the data: The data must be reduced in a way which does not lose information (such as merely selecting one or two variables from a domain), and the procedure can neither ignore nor eliminate the effects of student input on process measures and achievement.

As mentioned earlier, Cooley and Lohnes have been actively involved in finding a solution to this set of problems. They propose using a modification of John Carroll's model for the investigation of the educational process which is generalizable across educational settings and independent of the specific subject matter domain under investigation (Carroll, 1963). Of course, there are many possible ways in which the data can be grouped and examined, the selection of this particular one is largely a matter of convenience. Cooley and Lohnes also provide an analytic procedure which is an extension of Beaton's Commonality Analysis (Beaton, 1973) and which deals with the problem of accounting for input, process, and outcome information.

Model. The Cooley-Lohnes model consists of six components. Each component and the specific set of variables from the data set, which were used to construct the components, are listed below:

1. Initial input: "is a construct used to reflect the basic incoming skills of the children in the classroom

(Cooley & Emrick, p. 5)." This domain is represented by the sum of the Lorge-Thorndike test and initial student placement in mathematics, averaged across students at the classroom level.

2. Opportunity: is a construct which describes the time available to an individual student which is allocated to activities which are directly related to subject matter acquisition. This domain is represented by the sum of: time allocated per day to mathematics, time allocated per day to reading, the percentage of time spent in individualized activities, the smallness of the class size, and the use of exploratory assignments.

3. Motivation: "is a construct used to reflect the pupil's tendency to engage in learning activities when the opportunity exists." (Cooley & Emrick, 1974, p. 6). It is perceived as a construct which can reflect external (e.g., curricular and interpersonal) and internal influences. However, in this case the construct was not measured directly, and it is represented by the sum of the autonomy checklist score and student attendance.

4. Curricular Structure: is a construct designed to measure the degree to which a curriculum is organized and sequenced (linearly or not) and the degree to which a student and curriculum are successfully matched. This construct is represented by the sum

of the following variables: the percentage of assignments which are unique, the percentage of pretests given, the percentage of CETs given, the number of days since the last test, the number of units the student progressed in math, and whether or not math maintenance is being used.

5. Instructional (teaching) Event: is a construct which is designed to measure the frequency, quality, and duration of instructional contacts. In the present data, this dimension was not adequately measured. The variables included in this construct are the sum of the following: the percentage of assignments which were not ones involving recycling of the students, the number of years of teacher experience and experience with the program (because experience has in the past been correlated with better teaching practices [Leinhardt, 1974]), the number of days in which the teacher was present.

6. Outcome: is the end of year performance of students on the reading section of the Metropolitan Achievement Test and the math portion of the Wide Range Achievement Test.

This model provides a convenient, reduced structure by which the data can be grouped for ease in interpretation. The distinct advantage of the model is its relative simplicity and generalizability. It is clear that the model is being used post hoc in this case and that the variables are being "fitted" into it. However, the advantages of the clarity of

interpretation are felt to outweigh the disadvantages of a less than elegant fit between models and variables.

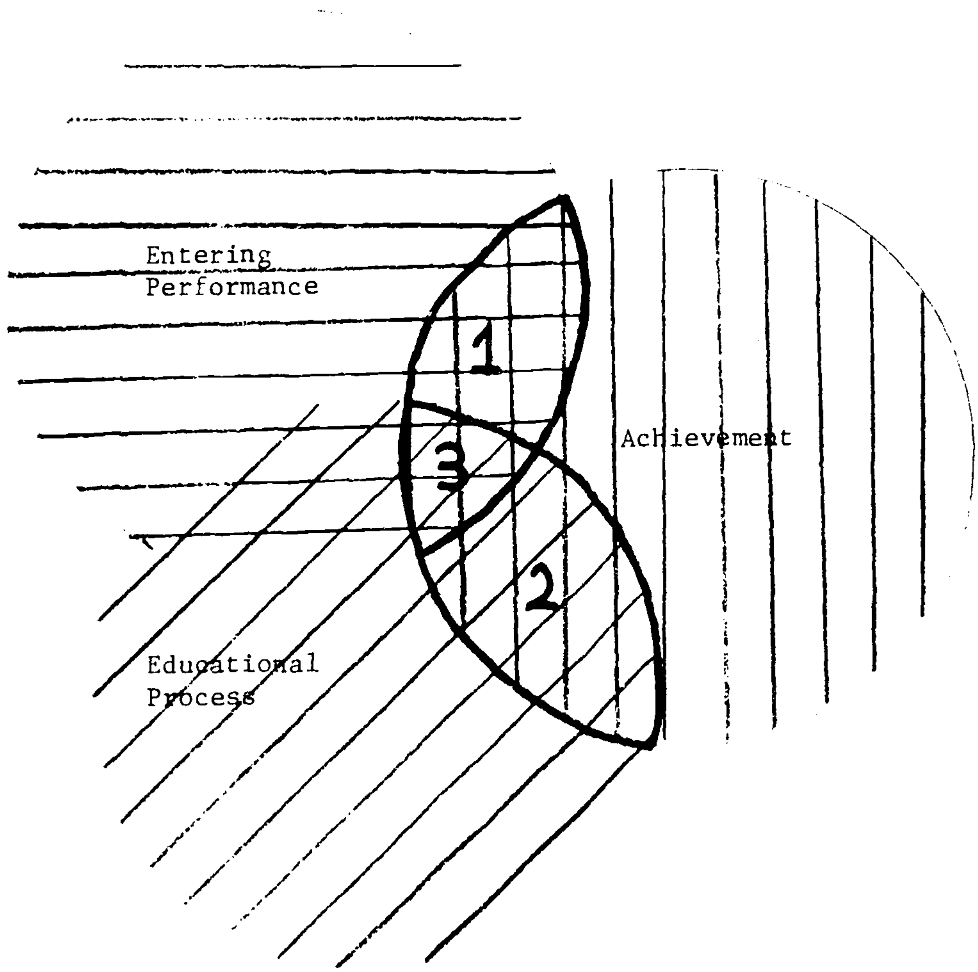
In addition to providing a conceptual schema for considering the data, the model provides a statistical one for analyzing the data. Essentially, the procedure is one of multiple regression in which the total variance explained by the model is partitioned into variance uniquely explained by one or more elements and variance which is commonly explained by the group of predictors. Figure 2 represents a simple case of the statistical model being used. While the figure is self-explanatory in the simple case, it should be obvious that in the case of multiple process variables, areas 2 and 3 on the figure become complex very rapidly.

Results. Table 8 presents the intercorrelations among the six constructs. It is worth noting that the four process constructs are positively related to both input and outcome measures; this implies that "good" classroom practices are confounded with high entering abilities on the part of students. Table 9 presents the results of the multiple regression of the first five predictors (input plus process) on the sixth variables, outcome. The top row represents the total R^2 for each of the five predictors. The second row represents the portion of total variance explained which is unique to each construct. The third row represents the variance explained confounded among all predictors in the system. The first row is the sum of the second and third rows.

The results in Table 9 clearly indicate that the most powerful predictor of student achievement in the spring is student abilities in the fall. The relationship between fall and spring scores explains 65 percent

Figure 2

Schema of the Partitioning
of Explained Variance into
Unique and Common Elements



1=Variance in achievement
explained uniquely by
entering performance

2=Variance in achievement
explained uniquely by
educational process

3=Variance in achievement
explained by both process
and entering performance

of the variance in spring performance. However, of the variance explained, 39 percent is unique to the input construct, while 26 percent is confounded with the other predictors.

The combined process variables explain 35 percent of total variance in achievement; however, an even smaller portion of that variance, 7 percent, is a result of the unique contribution of classroom processes. In examining Table 9 more closely, an interesting example of the utility of this type of analysis appears. The two process constructs, curricular structure and instructional event, appear to explain similar amounts of total variance, 17 percent and 16 percent respectively. However, the construct of instructional event is totally confounded with the other predictors (15.8 percent). The curriculum structure construct, however, is approximately two-thirds confounded and one-third unique.

The results from this analysis indicate that while classroom process information does not explain a large amount of the variance in end of year achievement, it certainly explains a portion of it. The specific contribution of each of the 22 variables is, of course, not considered here; however, it is hoped that the constructs have been identified clearly enough to permit the reader to understand the relative importance of cluster of variables to the explanation of student achievement.

A Comparison with Previous Results

Earlier in this paper it was mentioned that the evaluation of classroom processes is an ongoing concern. Therefore, data from 1971-72 are also available for comparative purposes. The data collected in 1971-72 are not identical to those collected in 1972-73; however, they have many variables in common or they are similar. Figure 3 lists the data for both

Figure 3
Comparisons by Construct of 1971-72 and 1972-73 Data

1972 - 73 Data N=52	1971 - 72 Data N=30
INPUT	**INPUT**
Lorge Thorndike	Lorge Thorndike
Math Placement	
OPPORTUNITY	**OPPORTUNITY**
Time allocated for Math	Time allocated for Math
Time allocated for Reading	Time allocated for Reading
Number enrolled	Number enrolled
Percentage of individualized time	
Exploratory assignments given	
MOTIVATION	**MOTIVATION**
Attendance	Attendance
Sum of autonomy check list	Child gets own work
	Play follows work
	Percentage of negative statements
STRUCTURE	**STRUCTURE**
Percentage unique assignments	Percentage unique assignments
Number of days since the last test	Number of days since the last test
Student Math progress	
Percentage of pretests	
Percentage of CETS	
Presence of a Math maintenance program	
INSTRUCTIONAL EVENT	**INSTRUCTIONAL EVENT**
Teacher program experience	Teacher program experience
Teacher total experience	
Number of days teacher was absent	
Percentage of post-tests	
	Number of cognitive statements
OUTCOMES	**OUTCOMES**
WRAT Math	WRAT Math
MAT Read	

years grouped by construct. The figure shows that for the most part the data gathered in 1971-72 is a subset of the data gathered in 1972-73. The exception is that classroom observation in 1971-72 yielded data not available in 1972-73; i.e., the percentage of negative statements, the number of cognitive statements, and the distribution of all teacher contacts over students.

Table 10 shows the intercorrelation among the six constructs for data collected during 1971-72. In this case, two of the constructs, opportunity and structure, are only slightly related to input, but both are related to outcomes.

Table 11 gives the total, unique, and confounded variances explained by each construct for the 1971-72 data. The overall R^2 is .607, which is lower than the overall R^2 observed in 1972-73. The total variance explained by input is 47 percent with 19 percent uniquely related to outcomes. This is probably due to the fact that the Lorge-Thorndike test is not as powerful a predictor as the Lorge-Thorndike plus initial student placement in the curriculum, which was used in 1972-73. The total variance explained by the process constructs is 41 percent; however, only 14 percent of that is unique.

Three things should be pointed out from this analysis. First, in both years input explains achievement better than process, both in total variance explained and in unique variance explained. Second, it appears that is is easier to improve the explanative capacity of input measures than it is to improve measures of classroom process. Third, Tables 9 and 11 indicate a considerable amount of fluctuation in the explanative capability of the specific process constructs. In the 1972-73 data, structure and instruction appear to be the most useful variables, while in 1971-72 opportunity and motivation are most useful. This is partly due to the changes of

specific variables over the two years (see Figure 3), but more important, it is due to the fact that this is a post hoc fit between variables and model. In order for the specific process constructs to be interpreted, measures with high construct validity will have to be developed; that is, measures specifically designed to tap each construct. Fourth, regardless of internal fluctuation within the model, classroom process variables appear to be relatively stable over time and setting in their ability to explain observed variance in student achievement.

Summary and Conclusions

In this study I have attempted to demonstrate several points. First, I have shown that a program of adaptive education can be implemented in a variety of educational settings. Second, I have shown that the classroom processes which surround the implementation can be identified and measured and that these measures provide information which is descriptive of the program and of the setting; thus providing information to educational consumers about key aspects of the program while providing information to developers about both the context in which their products are used and on the transformations which their products undergo. Third, I have shown that the program of adaptive education while varying in its implementation by classroom does not show systematic variation in success of implementation with respect to the ethnic composition of the school or the degree of urbanization of the school setting.

Finally, I have shown that the measures of classroom process are useful in helping to explain variance in end of year student achievement. However, it still appears that it is far easier to improve the explanative power of measures of student input than it is to improve the explanative power of measures of classroom process. Of course, process is the area in

which we as educators have manipulative control. Therefore, regardless of whether or not we can substantially increase the amount of variance explained, it is still the major portion of the educational environment over which we have qualitative control and responsibility. The full impact of classroom process on student achievement will only be clearly measurable and interpretable when the relationship between student entering abilities and educational process is reduced.

The results of this study raise some interesting issues for further research. The major issue concerns the utility of a generalized model of educational process. It appears to me that even though specific information about the nature of new programs can be of considerable value to both consumers and producers of educational products, there is a very great need to provide additional information which is independent of the specific programs involved. Such information should include specific measures of the teacher's and students' behaviors and curriculum usage with regard to: the opportunities for knowledge to be gained, the motivation for gaining that knowledge, the structure of the learning environment, and the quality of instructional events or interactions (Cooley and Lohnes, in preparation.). By designing measures of classroom process which are both universal enough to describe a variety of educational programs and specific enough to describe unique differences among situations, we can hope to improve our knowledge of which education practices affect which educational outcomes.

Table 1

Site Averages for Basic Classroom Context Information (1)

	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6		Site 7		Site 8		Site 9	
	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Total teacher experience[1]	2.2	1.9	6.0	8.1	3.3	4.3	22.4	15.8	13.5	15.2	7.5	11.2	10.3	12.4	3.2	2.9	29.0	.0
Teacher experience with the program[1]	.7	.5	.7	.5	.8	.4	2.2	.5	1.8	1.7	.5	.5	.1	.4	.8	1.1	8.0	.0
Teacher-aide team experience[1]	.3	.5	.4	.5	.3	.5	2.0	.0	.6	.5	.5	.5	.1	.4	.2	.4	2.0	.0
Number of children enrolled in the class	24.9	.12	24.8	1.5	25.3	3.7	24.8	3.0	20.6	2.2	20.7	.8	21.7	4.0	21.8	3.1	27.0	.0
Number of square feet per child in class	31.0	1.4	26.3	9.1	36.8	6.7	31.8	2.4	28.5	7.8	42.1	13.4	34.8	11.5	43.2	7.5	33.0	.0

[1] The variables were defined as the number of years prior to the 1972-73 academic year.

Table 2

Site Averages on Time Allocation (2)

	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6		Site 7		Site 8		Site 9	
	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD
Percent of time spent in individualized activity	48.8	6.9	72.4	9.7	45.8	15.6	74.2	6.1	77.5	7.5	58.5	5.7	69.5	5.9	66.6	13.1	80.0	.0
Percent of time spent in small group activity	21.5	11.3	10.1	3.9	15.5	6.2	13.4	2.6	3.8	2.8	23.0	8.7	15.8	5.9	13.2	6.4	20.0	.0
Percent of time spent in large group activity	30.7	7.3	17.3	7.4	39.7	15.0	12.0	4.1	18.3	8.1	18.5	9.2	15.6	6.0	20.2	11.4	.0	.0
Number of minutes of math daily	60.0	6.3	50.7	10.9	59.2	16.8	57.0	4.5	44.2	7.4	58.8	4.4	75.1	17.0	76.8	14.0	50.0	.0
Number of minutes of reading daily	106.6	19.0	88.6	10.7	76.0	12.6	110.2	11.6	85.8	8.0	100.0	11.3	96.9	12.1	150.0	42.4	64.0	.0
Number of minutes of educational TV watched	2.5	6.1	.0	.0	5.8	6.8	.0	.0	4.2	10.2	.0	.0	.0	.0	15.0	10.6	.0	.0
Different subjects studied at same time[1]	.5	.5	.3	.5	1.0	.0	.4	.6	.0	.0	.5	.5	.4	.5	.2	.5	.0	.0
Math maintenance program exists[1]	.7	.5	.9	.4	.0	.0	1.0	.0	1.0	.0	.9	.4	.6	.5	1.0	.0	1.0	.0

[1] The variable is coded as a 1 if the statement is true, if false it is coded as zero.

Table 3

Site Averages on Assignment Procedures (3)

	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6		Site 7		Site 8		Site 9	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Percentage of unique assignments[1]	83.5	2.7	81.5	5.1	77.0	7.8	86.2	3.4	82.3	9.8	82.1	5.4	85.3	3.1	79.8	7.1	57.0	.0
Percentage of blocked assignments[2]	63.8	15.1	52.6	11.0	58.7	10.8	53.6	20.0	47.3	17.1	57.1	12.8	60.9	22.8	61.0	9.8	89.0	.0
Exploratory assignments given[3]	.3	.5	1.0	.0	.5	.6	1.0	.0	.8	.4	1.0	.0	.9	.4	.4	.5	.0	.0
Assignments are changed during the day[3]	1.0	.0	.9	.4	.7	.5	1.0	.0	.8	.4	.9	.4	.9	.4	.6	.5	1.0	.0

[1]The percentage of the total math assignments given which were different from any other assignment given that day with respect to the unit level and skill being assigned.

[2]The number of math assignments given which were blocked divided by the total assignments made. Where blocking was defined as three (3) or more consecutive pages or boxes with less than an equal number of isolated pages or boxes.

[3]This variable is coded 1 if the statement is true and 0 if the statement is false.

Table 4

Monitoring Student Progress

	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6		Site 7		Site 8		Site 9	
	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Percent of pre-tests given in math	27.5	11.0	25.9	12.8	15.0	10.7	19.8	9.2	23.2	7.1	23.5	13.6	30.1	11.8	49.8	36.7	31.0	.0
Percent of CETs given in math	57.5	10.0	62.5	12.5	71.8	8.9	71.2	9.5	70.5	7.0	64.3	14.6	51.4	19.7	29.0	26.0	65.0	.0
Percent of post-tests given in math	14.5	3.9	12.6	4.3	13.5	5.1	9.4	4.0	6.33	3.7	12.4	6.4	12.0	5.4	18.0	25.0	4.0	.0
Number of days since the last test	4.5	1.4	4.9	2.7	3.5	1.6	4.1	2.0	3.4	1.3	7.0	3.9	9.7	16.6	7.8	7.5	.7	.0
Student math placement	7.0	2.4	4.2	3.1	9.6	5.1	20.9	5.9	13.7	5.9	7.2	4.9	8.1	4.5	9.8	2.3	10.5	.0
Student math progress	8.9	5.2	10.2	4.2	7.9	4.1	9.5	4.1	8.9	4.2	10.8	4.9	9.1	5.3	10.1	4.7	16.8	.0
Student reading placement[1]	3.7	3.9	3.0	3.1	3.4	1.8	13.1	3.7	6.6	3.3	3.9	3.1	3.6	2.9	5.5	4.0	14.4	.0
Student reading progress[1]	5.9	2.6	5.8	2.8	5.0	2.3	6.7	2.1	7.9	2.3	7.8	3.0	8.1	3.4	7.9	3.0	7.4	.0

[1] These represent placement and progress in the Sullivan series books 1-20 and do not include placement or progress in pre-reading, reading readiness or IPI skills.

Table 5

Provisions for Student Autonomy

	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6		Site 7		Site 8		Site 9	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Student controls access to exploratory[1]	.7	.5	.1	.4	.3	.5	.2	.5	.3	.5	.0	.0	.3	.5	.6	.5	.0	.0
Sum of autonomy check list score	5.9	1.5	3.7	1.5	4.1	1.8	5.1	3.2	2.9	1.3	4.4	1.0	3.9	1.9	4.6	1.3	5.0	.0

[1] If this occurs, the item is coded as 1; if not as 0.

Table 6

Teacher and Student Attendance

	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6		Site 7		Site 8		Site 9	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
# of days of teacher absence	8.5	10.3	9.6	10.9	7.3	7.9	4.2	2.7	12.0	24.0	4.0	2.0	6.8	3.7	8.0	2.4	3.0	.0
Percent of children present	94.5	2.3	93.9	4.5	96.7	2.1	96.4	3.6	91.0	6.3	91.9	3.6	94.3	2.7	75.6	8.3	96.0	.0

Table 7

Variable and Domain	URBAN/RURAL Univariate P Less Than	URBAN/RURAL Comments	RACIAL COMPOSITION Univariate P Less Than	RACIAL COMPOSITION Comments
Allocation of time				
1) percent of time in individualized activity	.46		.15	
2) the number of minutes in mathematics	.0001	Urban schools spend more time in mathematics	.03	Predominately black and integrated schools spend more time in mathematics
3) math maintenance program used	.92		.53	
Assignment Procedure				
4) percent of unique assignments	.38		.75	
5) percent of pretests	.009	Rural schools give more CETs than urban, however, urban schols give more pretests than rural schools.	.02	Predominately black and integrated school give more pretests than predominately white schools, however, predominately whit schools give more CETs.
6) percent of CETs	.0007		.0005	
7) number of days since last test	.18		.28	
8) student progress in math	.83		.31	
Student Autonomy				
9) sum of checklist	.16		.09	
Attendance				
10) number of days teacher was absent	.93		.87	

Table 8

Intercorrelation Among Six Educational Constructs

for 1972-73 Data N=52

	Input	Opportunity	Motivation	Structure	Instruction	Outcome
Input	1.00					
Opportunity	.03	1.00				
Motivation	.16	-.25	1.00			
Structure	.19	.30	-.22	1.00		
Instruction	.48	-.09	.01	.17	1.00	
Outcome	.80	.12	.12	.41	.40	1.00

Table 9

Total, Unique, and Confounded Variance Explained

by Construct $R^2=.72$ N=52

	Input	Opportunity	Motivation	Structure	Instruction
Total Variance Explained	.646	.014	.014	.170	.158
Unique Variance Explained	.391	.001	.005	.064	.000
Variance Explained Confounded with Other Predictors	.255	.013	.009	.107	.158

Table 10

Intercorrelation Among Six Educational Constructs

for 1971-72 Data N=30

	Input	Opportunity	Motivation	Structure	Instruction	Outcome
Input	1.00					
Opportunity	.06	1.00				
Motivation	.42	.26	1.00			
Structure	-.01	-.11	-.10	1.00		
Instruction	.45	-.06	-.07	-.04	1.00	
Outcome	.68	.33	.41	.16	.31	1.00

Table 11

Total, Unique, and Confounded Variance Explained

by Construct $R^2=.606$ N=30

	Input	Opportunity	Motivation	Structure	Instruction
Total Variance Explained	.466	.111	.170	.025	.097
Unique Variance Explained	.198	.082	.010	.045	.006
Variance Explained Confounded with Other Predictors	.268	.029	.160	-.020	.091

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